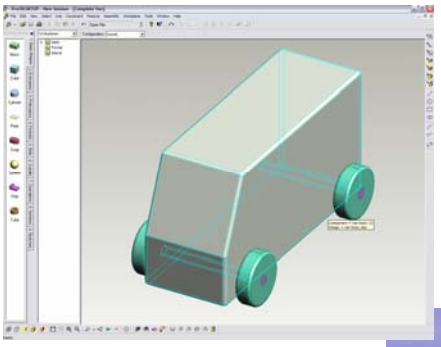
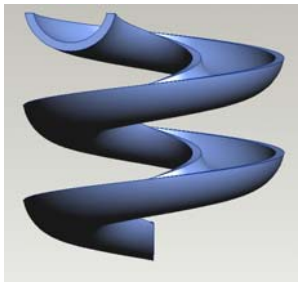
3-D Solid Modeling and Design

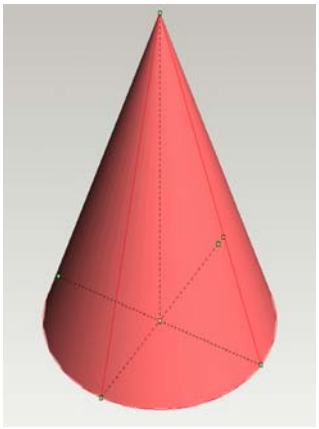
Student Learning Activities for

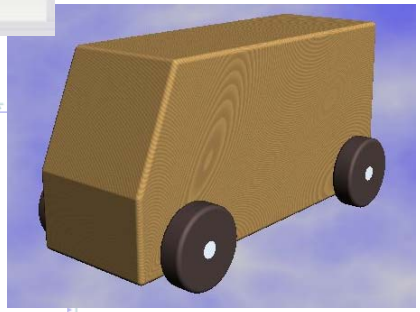
PTC Pro/DESKTOP® 8.0

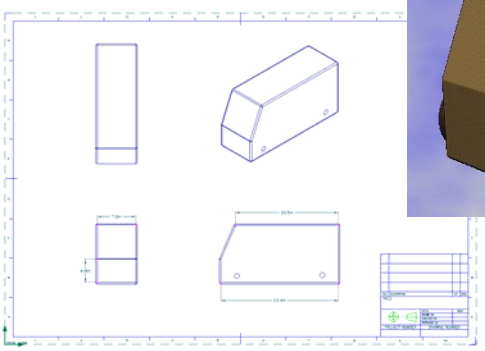
Activity #2

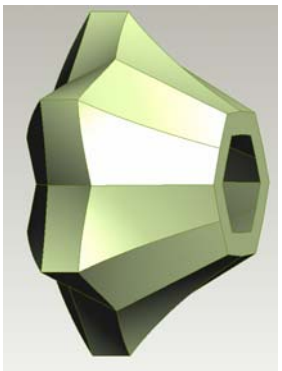












Activity 2:

“My First Design”

(Flesch-Kincaid readability level = 6.1)

About the program

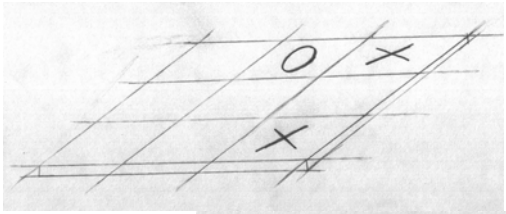
Pro/Desktop (called ‘PD’ from now on) is a powerful software program that allows you to sketch ideas first, and then work on design details later.

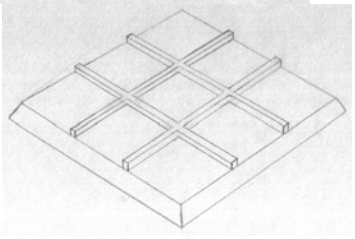
This activity will help you:

- Learn more principles and terms to use PD efficiently
- Create a simple design file with PD

User Terms:

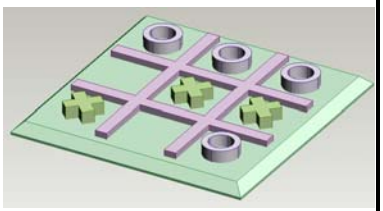
- Innovation
- Undo
- Redo
- Coordinates
- Profile
- Constrain (constraint)
- Handle
- Extrude
- Radio button
- Valid profile





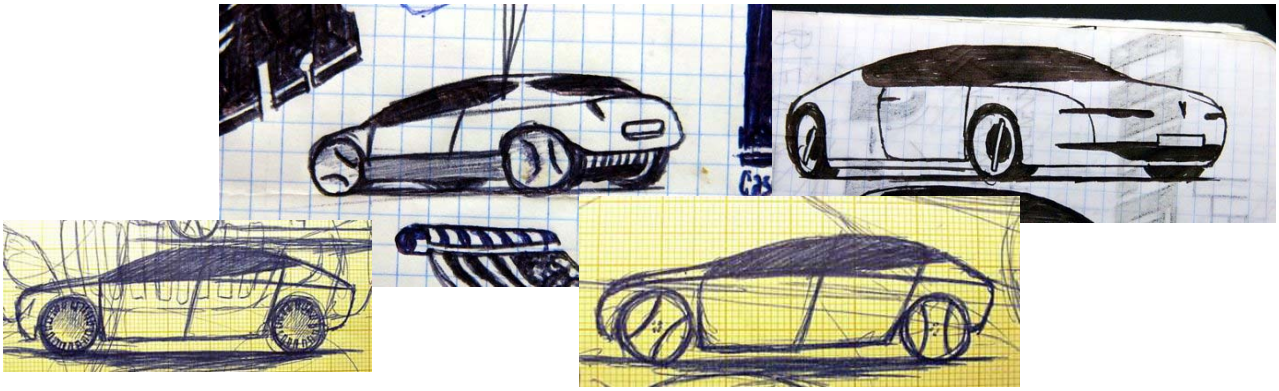
Sketch…Design...Innovation!

Look at these pictures:→
There are no words, but they are trying to tell you something. Can you guess what message is being sent?



The picture is simulating a sequence that starts with a simple **sketch** (shown in hand-drawn lines) and ends up with a 3-D **design** of what could be a real device. This is the goal of design through sketching. You can come up with an idea, sketch it, and then work out the details of the design as you go. **Innovations** (organizing thoughts into new designs) can be sketched in 2-D and then designed in 3-D by using powerful programs like PD.

Take a look at these sketches done by a graphic arts student. Could these one day be a reality?



(*Photos courtesy: http://www.luiscamino.com/cardesign/, 2005)*

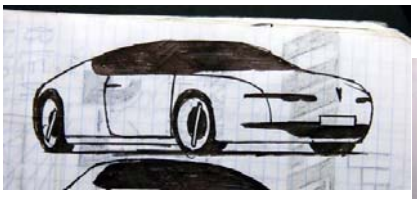
The chicken, or the egg?

(*Photo courtesy: http://www.aeb.org/kidsandfamily/which_came_first.htm , 2005)*

Which came first: The chicken, or the egg? If the chicken came first, from where did it originate? If the egg came first, then wouldn't a chicken have to first lay the egg? We may not be able to answer the chicken and egg question here, but we do know one thing about design through sketching: The sketch comes before the finished product. You can sketch by hand or on the computer.

When you sketch, don't worry about how big something is, or how small. Don't worry about weight, color, etc. The important thing is to get the idea out of your head and on paper or on a computer screen to start. Better ideas

and details will then follow. Design is an exciting communication process and often has very rewarding results…..

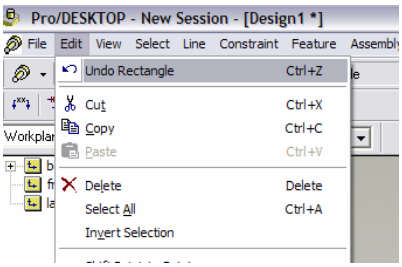


(*Photos courtesy: http://www.luiscamino.com/cardesign/, 2005)*

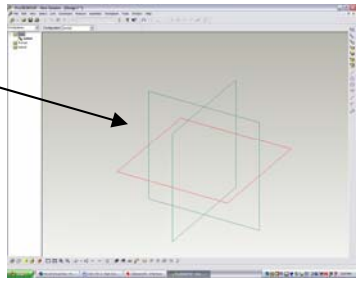
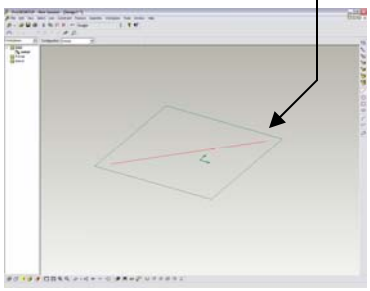
A word of caution…

As you begin drawing, remember these important principles using PD:

- Pressing the '**Esc**' key before you draw something will cancel the active command. For example, if you clicked the circle icon but wanted to draw a rectangle, simply press '**Esc**' to cancel the circle command.
- Although PD has an '**Undo**' command → (undoes the last command you just did), you can **only undo one step**. After that, you may have to delete a portion of your drawing and make a new, correct one.



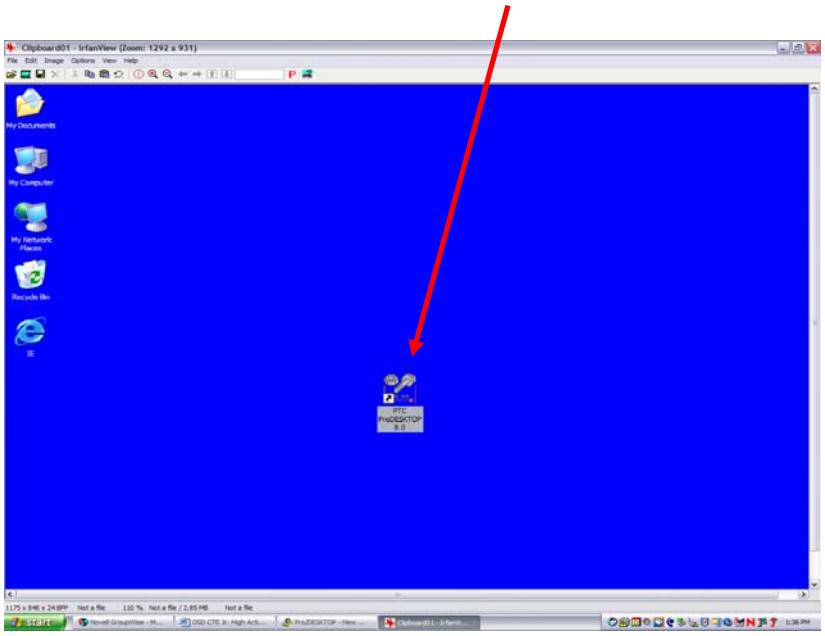
- PD does not have a '**Redo**' command (redoes the command you had just undone with 'Undo'). Once you undo a command, it is gone.
- PD will only show the *x,y* axis arrows. →  It will not show the *z* axis arrow on your workplane.
- When you click any workplane in the **Object Browser Pane**, all three workplanes appear. As soon as you click on a drawing tool (line, circle, rectangles, etc.) and begin to draw, the active workplane will be the only one that appears.

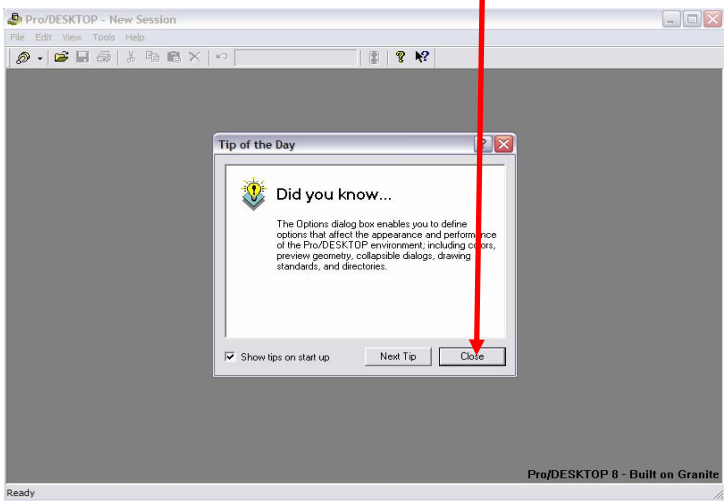
Let's begin!

Finally! It's time to make a 2-D drawing (*x*,*y* axis)

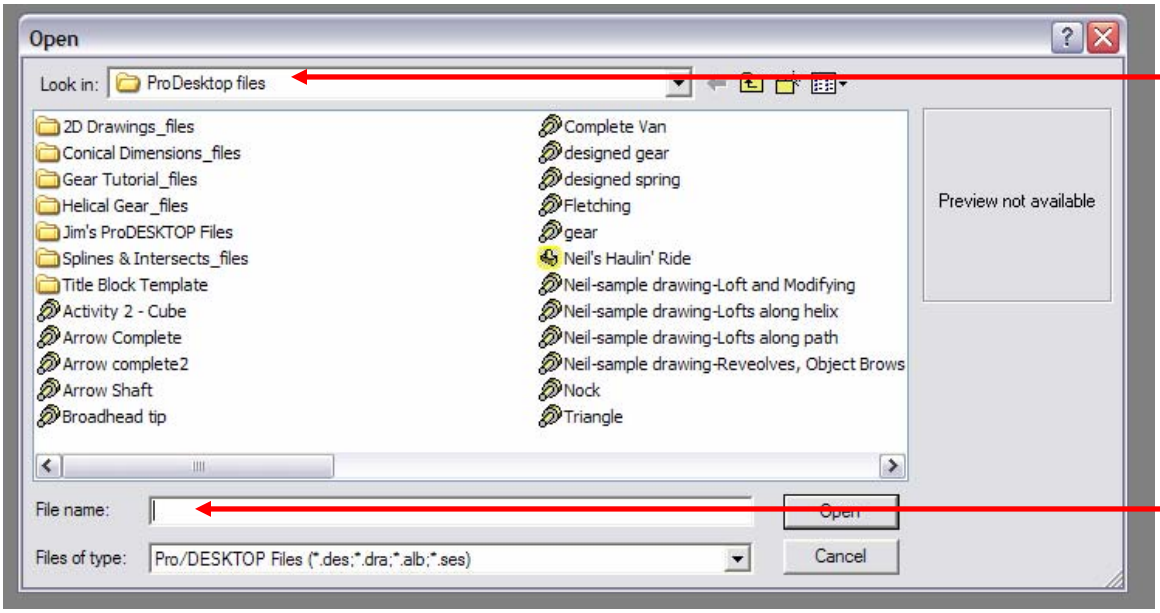
Step 1: Open PD by finding the PD icon on the desktop screen of your computer. Double-click the icon.



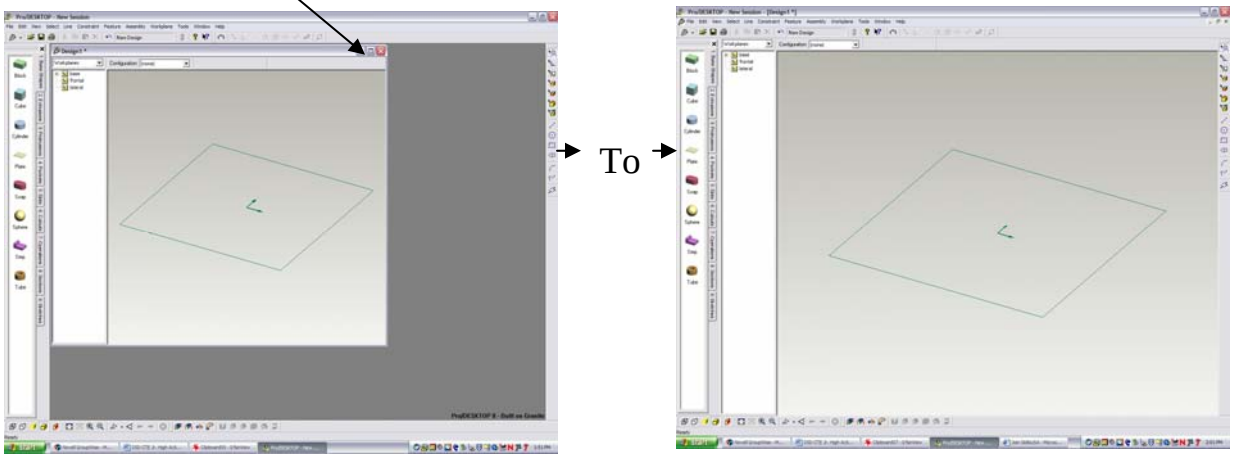
Step 2: You may have a 'Tip of the Day' window pop up before you can actually run PD. Click on the 'Close' button.



Step 3: Open your saved file from Activity 1 by left-clicking once on the 'File' pull-down menu. Left-click the word 'Open'. A new window will appear prompting you to select a location and file to open.
If you need assistance finding your file from Activity 1, please ask your instructor for help.

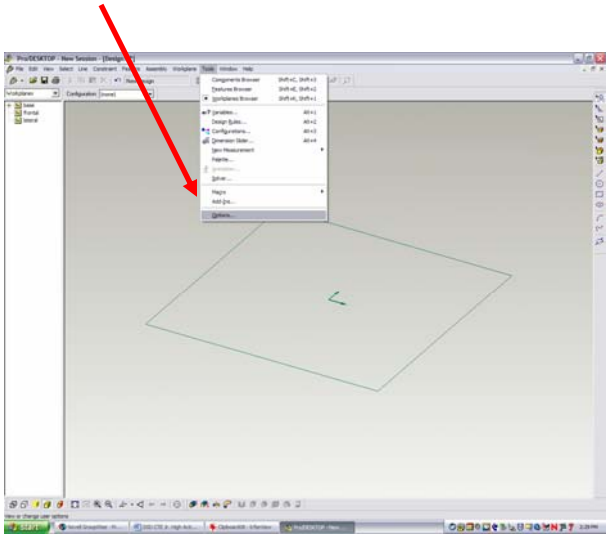


Step 4: Maximize by clicking once in the maximize/restore down button.

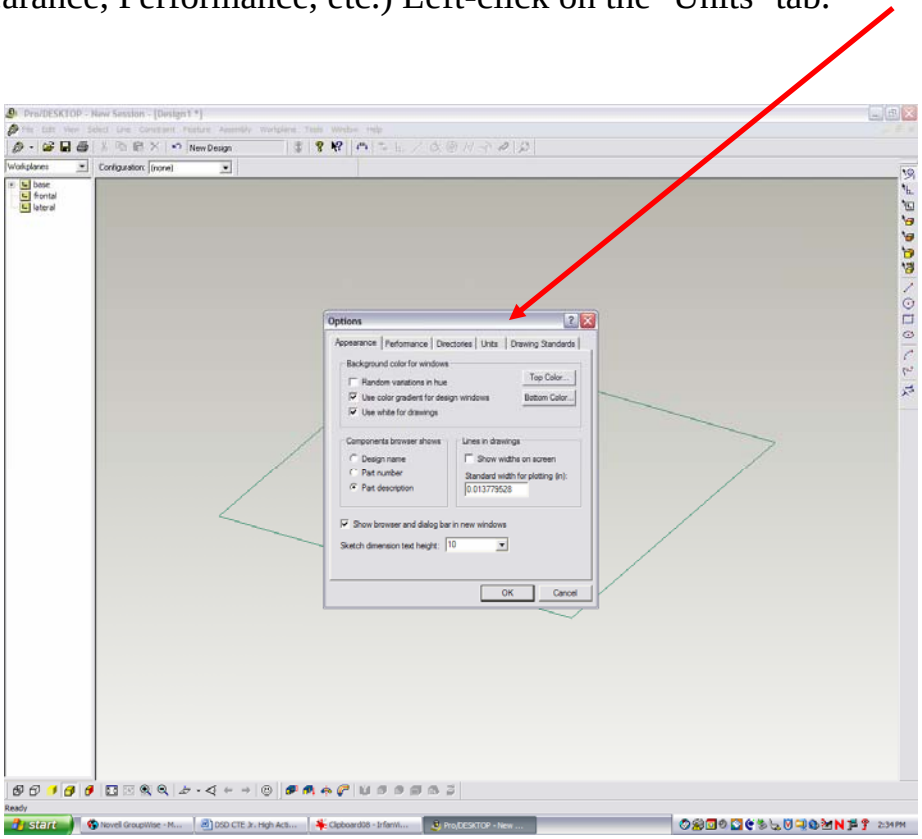


Step 5: The sketch that you are making will be done in **inches**. To make sure PD is set to inches and not millimeters, do the following in order:

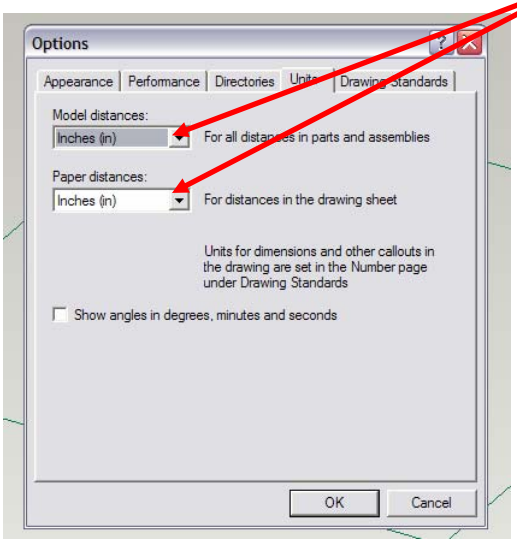
Left-click the 'Tools' pull-down menu. Left-click on the word 'Options'.



An 'Options' box will appear with several index tabs across the top (Appearance, Performance, etc.) Left-click on the 'Units' tab.



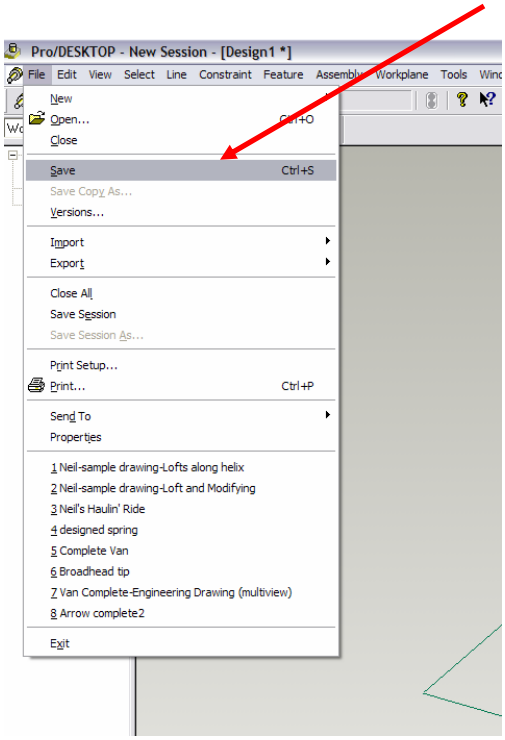
Left-click on the scroll-down arrow and select ‘Inches’ for both fields if this unit does not already show in the two boxes as below:



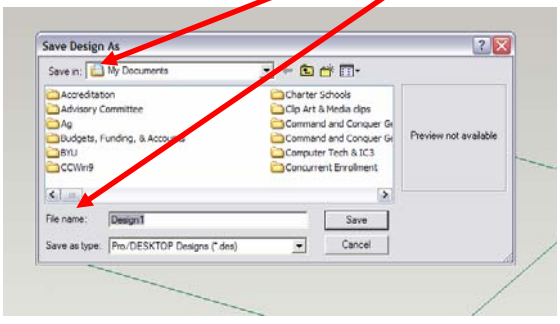
Click ‘OK’.

Save often!!!!

Try to remember to save your sketches often so that even small changes don’t have to be done over. To save, left-click on the ‘File’ pull-down menu. Left-click again on ‘Save’.

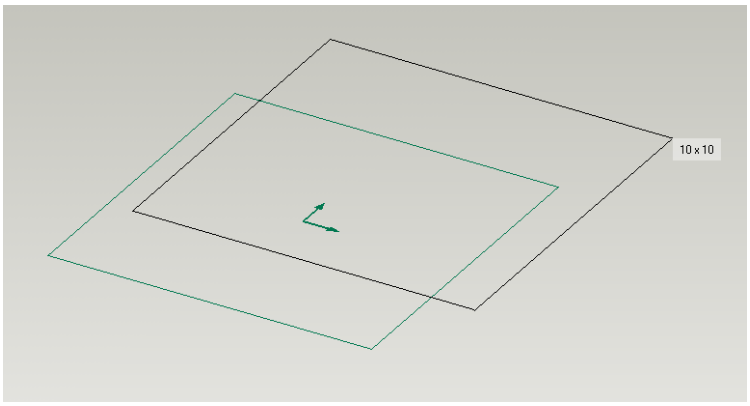


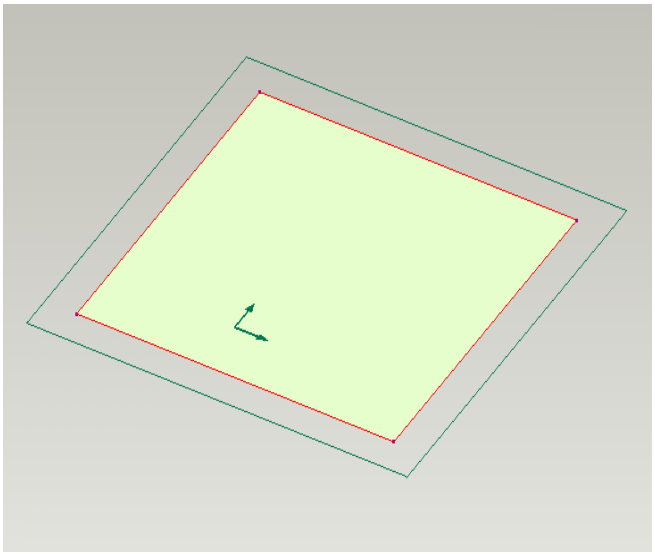
Your instructor will tell you to what location you must save your file and what you should name it. Go ahead and save your file for the first time now.



2-D Sketching

Left-click on the rectangle icon  in the Design Toolbar. Now, **hold down** either 'Shift' key on the keyboard. Left-click anywhere inside of the active workplane and **hold down the left mouse button**. Drag the square that starts to appear in any direction until the **coordinates** read 10 x 10. Coordinates are numbers that express *x*,*y*, and also *z* (in 3-D designs).





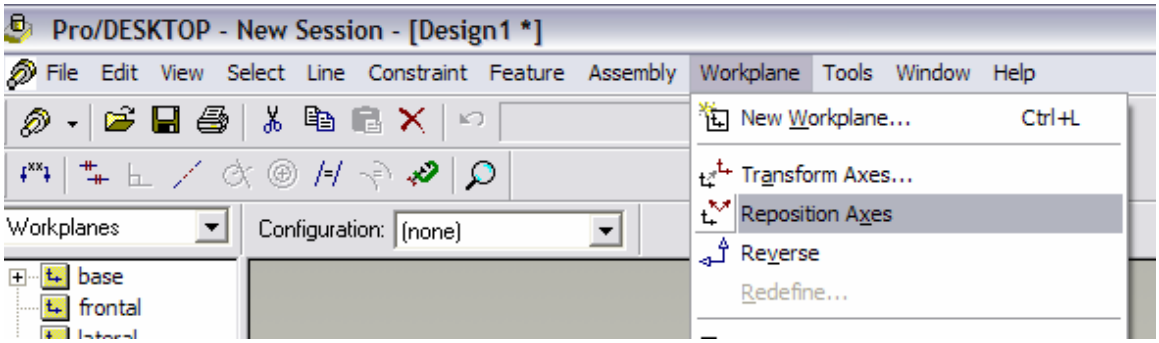
Let go of the left-click button and then the 'Shift' key. It is okay to drag outside of the workplane as you sketch your square. When you let go of the button, the workplane re-draws itself around the new sketch. This new drawing is called a **profile**. A profile is any surface of a sketch or a design. Don't worry if the color of your profile is different than this.

If you make a mistake, immediately click the 'Undo' button. Remember, you can only back up one step with 'Undo'.

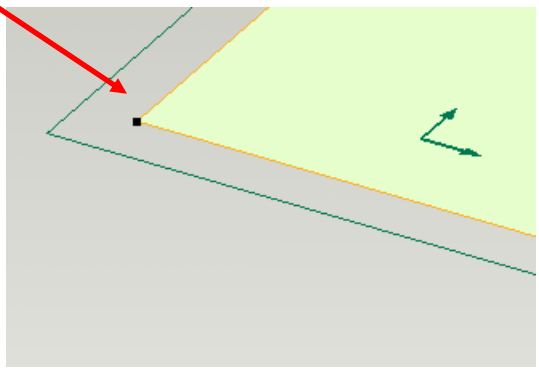
If you feel you have made too many mistakes and can't 'undo' enough**,** ask your instructor for assistance, or you can simply **exit without saving** and start a new sketch.

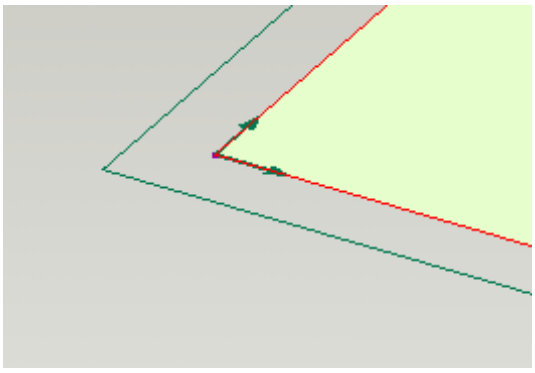
The reason you held down the **shift** key while dragging is because this command **constrains** (places limits on) the rectangle to have sides of equal length. Constraints force the rectangle to become a perfect square. Remember this important feature of holding the 'Shift' key. It helps!

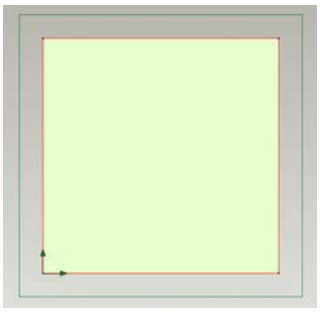
You can reposition the point of origin for the axes and make a corner of your square become the point of origin, or, the (0,0) coordinate. To do this, click on the 'Workplane' pull-down menu and then click on 'Reposition Axes'.



Your cursor turns into a small cross. Place the center of the cursor over the lower left-hand corner of your square. A small, black square called a **handle** (a point in a drawing that can be controlled separately from the rest of the drawing) appears. Click when the handle is present and the point of origin now becomes this corner.







Now, change from an isometric view to the workplane view seen here.

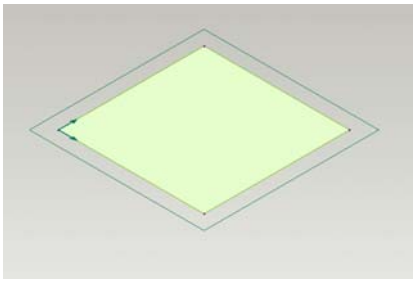
Do you remember from Activity 1 how to do this? If not, you can look at the instructions on the next page.

To change from the isometric to the workplane, or 'flat' view, left-click on the 'View' pull-down menu. Move the cursor down to the words 'Go To'. **Without clicking**, move the cursor over to the words 'Onto Workplane'. Click once.

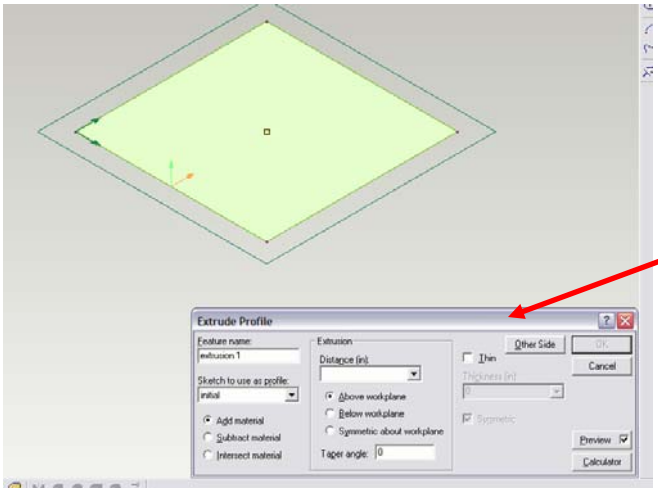
Save your drawing at this point.

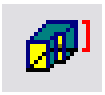
Extrusion

When you **extrude** a drawing, you make it turn into a 3-D design. Extruding gives a sketch thickness. Remember from Activity 1 how you stood your pencil up on a flat piece of paper to make the *z* axis? Now you will do the same thing with your rectangle. It will turn from a drawing to a design.



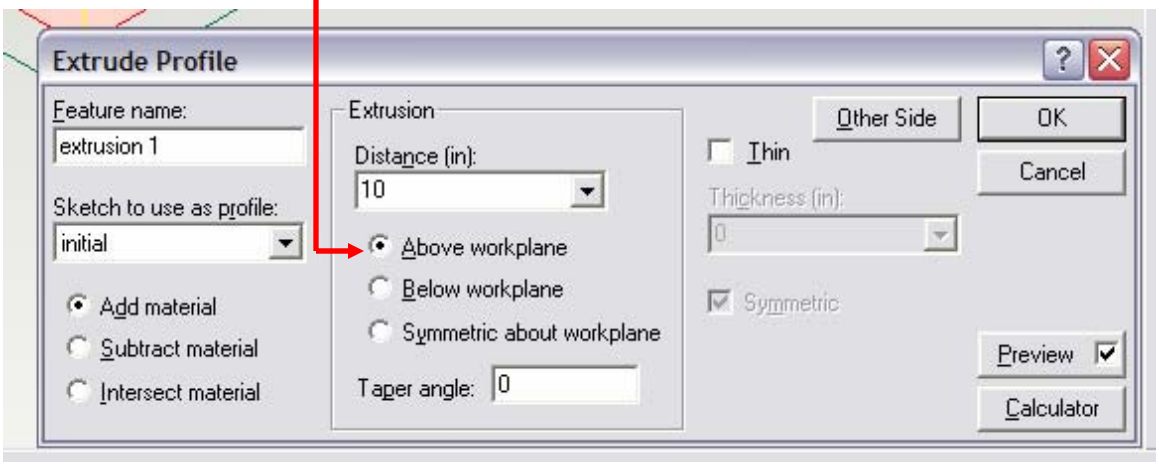
Return to the isometric workplane by clicking on **View**, then **Go To**, then **Isometric**.



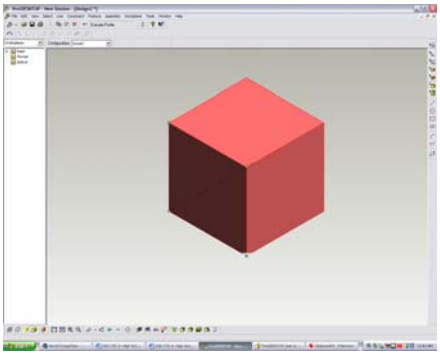
Click on the **Extrude Profile icon** →  in the Features Toolbar. When you do, a new **dialogue box** appears.

A **dialogue box** is a window that pops up on the screen with options that the user can select. Since we will need to select the thickness of our design, we will need to enter the correct data in the box.

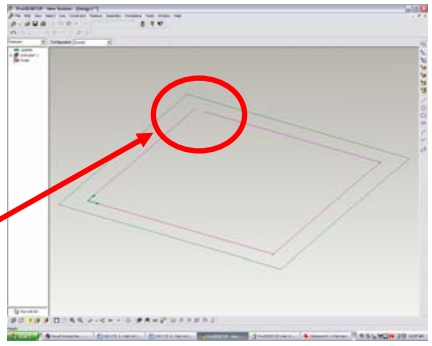
Near the center of the box is the ‘Extrusion’ column. Using the keyboard, key the number ‘10’ in the ‘Distance’ field. Next, click the ‘Above workplane’ **radio button** (small, white circle to the side of the selected words) so that a black dot appears in the space.



While this is happening, notice what is taking place in the design field. Now click ‘OK’. You have extruded, or ‘stretched’ your drawing into the *z* axis. The **red** color indicates that it is a **valid profile** (a profile that has no gaps or broken lines).



If you ever have a profile that does not fill in with a color when it is supposed to form a shape, there are joints that do not come together and it is not a valid profile. Such a drawing will not extrude.



Save your design according to your instructor’s directions.
You have completed this activity using PD! Exit the program and complete the following matching assignment on a separate sheet of paper.

Student name:_____ Student Number:_____
Class period:_____Date:_____Teacher:_____

STUDENT WORKSHEET Pro/DESKTOP 3-D Modeling Software

Activity 2: "My First Design"

Directions: Write the letter of the most correct definition to the term used in this activity in the space provided:

Term	Definition
___1. Innovation	a) Redoes the command you had just undone with 'Undo'
___2. Undo	b) Any surface of an object being drawn
___3. Redo	c) Organizing a thought into a new design
___4. Coordinates	d) Place limits on
___5. Profile	e) Small, white circle to the side of the selected words
___6. Constrain /constraint	f) Gives a sketch thickness
___7. Handle	g) A profile that has no gaps or broken lines
___8. Extrude /extrusion	h) Numbers that express *x*,*y*, and also *z* (in 3-D designs)
___9. Valid profile	i) A point in a drawing that can be controlled separately from the rest of the drawing
___10. Radio button	j) Undoes the last command you just did